FOREST DEVELOPMENT RESEARCH TRUST FUND

ANNUAL REPORT

1988/89

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Forest Service

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The Honourable LeRoy Fjordbotten
Minister of Forestry, Lands and Wildlife
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Sir:

I have the honour of submitting the Annual Report of the Forest Development Research Trust Fund for the fiscal year ending March 31, 1989.

Respectfully submitted,

C. B. Smith, Chairman
Alberta Forest Research
Advisory Council

FOREWORD

The Forest Development Research Trust Fund Act was enacted in 1974 by the Legislative Assembly of Alberta. This Act established the Forest Development Research Trust Fund (FDRTF) and created a Forest Research Advisory Council, which was to set research priorities and evaluate research proposals submitted to the Fund.

In 1987, the Canadian Council of Forest Ministers recommended that each province establish a single advisory committee to oversee forestry-related research and development activities. The Alberta Department of Forestry, Lands and Wildlife responded by expanding and restructuring the Alberta Forest Research Advisory Council (AFRAC) to include representation from provincial and federal governments, academia, the Alberta Research Council and senior executives of the Alberta forest industry. AFRAC sets and reviews research priorities and coordinates research activities in the province. The 1974 Forest Research Advisory Council was renamed the Forest Development Research Trust Fund (FDRTF) Committee and is responsible for evaluating research proposals submitted to the Fund.

The purpose of the FDRTF is to provide financial contributions to both the private sector and public institutions to conduct problem-oriented and basic research in the area of forest management. The research results should lead to improved forest land management practices and to improve forest utilization in harmony with long-term economic, aesthetic and social values.

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PROJECTS COMPLETED

PROJECTS COMPLETED

1. *Cultural and taxonomic studies of ectomycorrhizal fungi associated with lodgepole pine and white spruce in Alberta.*

   Dr. R. Currah - University of Calgary

   Dr. L. Sigler - University of Calgary

2. *Nitrogen - moisture interaction and lodgepole pine seedlings.*

   Dr. V. Lieffers - University of Alberta

CULTURAL AND TAXONOMIC STUDIES OF ECTOMYCORRHIZAL FUNGI ASSOCIATED WITH LODGEPOLE PINE AND WHITE SPRUCE IN ALBERTA.

INVESTIGATOR: Dr. R. Currah, University of Calgary
Dr. L. Sigler, University of Calgary

DURATION: Three years (1986/87 to 1988/89)

OBJECTIVES:

1. To acquire baseline data on the possible mycorrhizae associates of lodgepole pine and white spruce in the Rocky-Clearwater and Bow-Crow Forests of Alberta.

2. To identify the cultural characteristics of mycorrhizal associates determined as part of (1) above.

3. To provide a facility for the long-term storage of ectomycorrhizal fungi of importance to basic and applied research in forestry in western Canada.

PROGRESS: A detailed description of 66 species (from 260 samples) of ectomycorrhizal fungi is provided. Details such as habitat, tree species association, sporophore description and habitat, and colonial morphology are provided for the species that were cultured successfully. Living strains and herbarium species were deposited at the University of Alberta Microfungus Collection and Herbarium. The viability of each strain is maintained using two of four storage methods (cold water storage, oil storage, liquid nitrogen storage and cold storage). The relative effectiveness of storage in cold water versus liquid nitrogen was examined for a selection of strains.

FUTURE WORK: Project completed. The final report has been submitted.

NITROGEN - MOISTURE INTERACTION AND LODGEPOLE PINE SEEDLINGS.

INVESTIGATOR: Dr. K. O. Higginbotham, University of Alberta (1987/88)
Dr. V. Lieffers, University of Alberta (1988/89)

DURATION: Two years (1987/88 to 1988/89)

OBJECTIVES:

1. To determine the effect of the interaction of water and nitrogen stress on the growth, nutritional status and water relations of lodgepole pine seedlings.

2. To determine the effect of this interaction (from (1)) on the response to these stresses.

3. To relate these findings to the practice of producing nursery seedlings for outplanting.

PROGRESS: The only variable measured that was affected by the interaction of additive nitrogen rates and water stress was dry weight (the effect was antagonistic). Other measured factors such as root:shoot ratio, fresh:dry weight ratio, xylem pressure potential, stomatal conductance and foliar N, P and Mg concentrations were affected by either N rates or moisture stress, but not the interaction of the two factors.

It was found that regardless of subsequent treatments, seedlings that were water stressed in the preconditioning phase exhibited lower tissue hydration at the end of the experiment, implying a substantial and persistent change in physiology.

Recommendations for nursery practises and operational trials include the use of exponential rates of fertilizer to control growth rates and resistance to stresses during the exponential phases of seedling growth. Seedlings that suffer early setbacks in growth do not match the same growth success as do unstressed seedlings.

FUTURE WORK: Project completed. A final report has been submitted.

RENEWED PROJECTS

RENEWED PROJECTS

1. *Characterization of the native growth hormones of juvenile lodgepole pine and their relationship to vegetative growth, and especially to the aspect of inherent superiority in vegetative growth.*

   Dr. R. P. Pharis - University of Calgary

2. *General equilibrium model of the Alberta economy with reference to the forest sector.*

   Dr. Constantino - University of Alberta

CHARACTERIZATION OF THE NATIVE GROWTH HORMONES OF JUVENILE LODGEPOLE PINE AND THEIR RELATIONSHIP TO VEGETATIVE GROWTH, AND ESPECIALLY TO THE ASPECT OF INHERENT SUPERIORITY IN VEGETATIVE GROWTH.

INVESTIGATOR: Dr. R. P. Pharis - University of Calgary
Dr. B. Dancik - University of Alberta
Dr. F. Yeh - University of Alberta

DURATION: Three years (1987/88 to 1989/90)

OBJECTIVES:

1. To determine efficient and cost-effective ways to screen families, and genotypes within families, for inherently superior vegetative traits.

2. To understand what factors control early vigour of seeded and planted stock and how this vigour may possibly be enhanced.

PROGRESS: Conifers, like many other plants, can exhibit inherently rapid vegetative growth, and the potential for this inherent ability to grow rapidly can be tested at a very early age. This was demonstrated by the strong relationships existing between field height measurements at ages 6 to 10 years, and height increment measures at 1.5 to 3.0 months of age. Conifers also exhibit growth in "fast-growing" or "slow-growing" families. The fast-growing traits can be described since they may have optimal or near-optimal endogenous concentrations of growth-promotive gibberellins.

Conversely, slow-growing genotypes may lack the ability to produce optimal concentrations of growth-promoting gibberlic acids or to utilize supra-optimal concentrations.

FUTURE WORK: This is the second of a three-year project. The final stage of this study will involve the development of cost- and time-effective means to screen for inherently superior growth.

GENERAL EQUILIBRIUM MODEL OF THE ALBERTA ECONOMY WITH REFERENCE TO THE FOREST SECTOR.

INVESTIGATORS: Dr. L. F. Constantino, University of Alberta
Dr. M. B. Percy, University of Alberta
Dr. W. E. Phillips, University of Alberta

DURATION: Three years (1987/88 to 1989/90)

OBJECTIVES: To assess the impact of:

1. federal-provincial agreements with the province;
2. AAC regime on production in wood products and pulp industries;
3. forestry expansion on industries with competing uses for land base, and on regional and provincial incomes and employment;
4. movements in exchange rates, wood products and pulp and paper prices on forest industry and provincial incomes; and,
5. technological change in forest products technology on employment and production in the forest industry through time.

PROGRESS: The general equilibrium model has been developed and implemented on a Lotus spreadsheet for easy access. The model is currently made up of 71 equations based on an industrial structure of 13 sectors. The model has been completely debugged and is fully operational.

FUTURE WORK: During the final year of the project, economic and policy simulations using the model will be completed. The following two sets of simulations will be tested:

a) analysis of sudden economic events in the forestry sector and how they affect the rest of the economy; and

b) analysis of unexpected economic events elsewhere in the economy and how they affect the forestry sector.

A final report is in preparation. It will include a computer diskette containing the appropriate programs to run the model.

NEW PROJECTS

NEW PROJECTS

1. *Lichen regeneration rates in Alberta following various types of logging disturbance and wildfire.*

   Dr. D. Woodard - University of Alberta

2. *Control of Armillaria root rot in intensively managed lodgepole pine stands.*

   Dr. P. Blenis - University of Alberta

3. *Variability of soil temperature substrate water content and tree growth on two drained and undrained Alberta peatlands.*

   Dr. R. L. Rothwell - University of Alberta

4. *Evaluating lodgepole pine for resistance to western gall rust.*

   Dr. P. Blenis - University of Alberta

LICHEN REGENERATION RATES IN ALBERTA FOLLOWING VARIOUS TYPES OF LOGGING DISTURBANCE AND WILDFIRE.

INVESTIGATOR: Dr. P. Woodard, University of Alberta

DURATION: Three years (1987/88 to 1989/90)

OBJECTIVES:

1. To assess lichen regeneration on cutblocks aged 2 - 30 years, in the Weldwood (Hinton) FMA, and on unlogged fire-origin forest types in the 2 (if possible) to >180-year-old range.

2. To develop a procedural system to monitor lichen regeneration on cutblocks.

3. To assess the effectiveness of the timber harvesting guidelines developed for the FMA with respect to maintaining caribou habitat, focusing specifically on lichen regeneration.

PROGRESS: Thirteen cutblocks were sampled in the 1988 field season in two ecoregions (Subalpine and Upper Boreal), and three age classes (30 years, 10 years and <2 years). Vegetation samples from the blocks have been collected and will be analyzed along with stand disturbance age and history, to determine if forest management practices have a significant effect on lichen survival or regeneration rates.

FUTURE WORK: Additional fieldwork is required, but that should ensure an adequate sample size for future analysis.

CONTROL OF ARMILLARIA ROOT ROT IN INTENSIVELY MANAGED LODGEPOLE PINE STANDS.

INVESTIGATOR: Dr. P. V. Blenis, University of Alberta

DURATION: Three years (1988/89 to 1990/91)

OBJECTIVE: To develop guidelines for thinning overstocked lodgepole pine stands that are infested with Armillaria root rot.

PROGRESS: A total of 66 plots has been established in three stands containing pine densities ranging from 7000 to 24000 stems per hectare. Each plot consists of three subplots receiving the following treatments: one plot left as control, one plot thinned to 1.5 m spacing, and the remaining plot thinned to 2.5 m spacing. Infected trees in each plot were removed to ensure that any additional mortality was post-treatment.

FUTURE WORK: Subsequent field measurements will map the locations of initially killed trees and those newly killed (i.e., post thinning). The maps will show the following: (1) the amount of mortality associated with the different treatments; and (2) the distribution of newly killed trees in relation to the trees that were killed initially. The distribution of newly killed trees will provide the basis for recommending the best thinning strategy to minimize Armillaria root rot in regenerated stands.

VARIABILITY OF SOIL TEMPERATURE, SUBSTRATE WATER CONTENT AND TREE GROWTH ON TWO DRAINED AND UNDRAINED ALBERTA PEATLANDS.

INVESTIGATOR: Dr. R. L. Rothwell, University of Alberta
P. Rivard, Ph. D. candidate, University of Alberta

DURATION: Two years (1988/89 to 1989/90)

OBJECTIVES:

1. To evaluate the effects of peatland drainage on tree growth in terms of substrate temperatures and water contents (including the magnitude and variability of each) on temporally and spatially, drained and undrained peatlands.

2. To relate the variability of thermal and hydrologic regimes of drained and undrained peatlands to variability in growth.

PROGRESS: Water and temperature measurements have been taken on drained and undrained areas at two locations: the Salteaux River and the Wolf Creek drainage sites. Climatic data were recorded to help interpret water table levels and drying observations. Three black spruce and one tamarack tree were measured for growth within 1 m of each temperature sample point. All data have been organized and entered onto a computer, ready for analysis.

FUTURE WORK: Work is progressing as planned.

EVALUATING LODGEPOLE PINE FOR RESISTANCE TO WESTERN GALL RUST.

INVESTIGATOR: Dr. P. V. Blenis, University of Alberta

DURATION: One year (1988/89)

OBJECTIVES:

1. To determine the variation in resistance to western gall rust that is present on individual trees and in stands.
2. To establish standards that could be used as benchmarks for resistance in subsequent experiments.
3. To determine the most efficient members of seedlings and replications to be used in screening for resistance.

PROGRESS: Cones were collected from five trees in each of five provenances in the Hinton area. Seeds were germinated and planted, fertilized, watered and exposed to a constant 20° C temperature.

Gall rust spores were collected from four locations, cleaned and stored. Twenty trays of seedlings (five provenances x four spore locations) were inoculated with the spores and were evaluated for infection every three weeks up to 18 weeks.

Analysis of variance revealed that there was a significant family effect, but no significant effects due to provenance, spore location or the interaction of spore location with provenance or family, The significance of family effects suggests that gains could be made by selecting families with superior gall rust resistance.

From simulation runs, it would appear that three to four replicates are sufficient to screen for resistance. Based on distributions of different sample sizes, it would appear that 10 to 15 seedlings per replicate would be appropriate.

FUTURE WORK: Project completed. The final report has been submitted.

FINANCIAL STATEMENTS

FOREST DEVELOPMENT RESEARCH TRUST FUND

FINANCIAL STATEMENTS

MARCH 31, 1989

Auditor's Report

Balance Sheet

Statement of Revenue, Expenditure and Unexpended Funds

Notes to the Financial Statements

ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Council of the Forest Development
Research Trust Fund

I have examined the balance sheet of the Forest Development Research Trust Fund as at March 31, 1989 and the statement of revenue, expenditure and unexpended funds for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1989 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Donald D. Salmon
FCA
Auditor General

Edmonton, Alberta
August 14, 1989

FOREST DEVELOPMENT RESEARCH TRUST FUND

BALANCE SHEET

AS AT MARCH 31, 1989

	1989	1988
ASSETS		
Current:		
Cash	$124,065	$163,363
LIABILITIES		
Current:		
Research grants payable	$ 45,300	$ 56,422
Unexpended funds	78,765	106,941
	$124,065	$163,363

The accompanying notes are part of these financial statements.

FOREST DEVELOPMENT RESEARCH TRUST FUND

STATEMENT OF REVENUE, EXPENDITURE AND UNEXPENDED FUNDS

FOR THE YEAR ENDED MARCH 31, 1989

	1989	1988
REVENUE		
Contributions by the Province of Alberta (Note 3)	$ 85,000	$100,000
Interest	13,171	16,061
Donations	-	230
	98,171	116,291
EXPENDITURE		
Research grants	126,347	138,629
Deficiency of revenue over expenditure	(28,176)	(22,338)
Unexpended funds at beginning of year	106,941	129,279
Unexpended funds at end of year	$ 78,765	$106,941

FOREST DEVELOPMENT RESEARCH TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS

MARCH 31, 1989

Note 1 Authority

The Forest Development Research Trust Fund operates under the authority of the Forest Development Research Trust Fund Act, Chapter F-13, Revised Statutes of Alberta 1980.

Note 2 Changes in Financial Position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Contributions by the Province of Alberta

The Department of Forestry, Lands and Wildlife provides contributions annually for research and council members' expenditure incurred by the Fund. Where expenditure is less than the contributions in any given year, the balance is repayable to the General Revenue Fund.

Note 4 Administration Expenses

Salaries, accommodation, and other administrative costs incurred in the administration of the Fund are borne by the General Revenue Fund and are not reflected in these financial statements.

Note 5 Commitments

As at March 31, 1989, the Fund had research grant commitments totalling $74,110 (1988 $126,504).

Note 6 Approval of Financial Statements

These financial statements were approved by management.